stretching the resonance member and therewith also influencing the resonance frequency f_0.

BRIEF DESCRIPTION

Therefore, it is an object to provide a method and a device which allows to determine the height of a settled bed in a mixture in a loading space accurately and efficiently.

According to an aspect of the embodiments, there is provided a method for determining a height (h_s) of a settled bed in a mixture in a loading space of a vessel, wherein the mixture consists of a settled bed and a mixture soup which is located above the settled bed, and wherein the method comprises:

a) providing an elongated resonance member in the loading space which extends in a substantial vertical direction,

b) measuring a resonance frequency (f_o) of the resonance member,

c) computing a height (h_s) of the settled bed based on the measured resonance frequency (f_o),

wherein b) comprises determining an indication of or imposing the tensile force (F_s) acting in the longitudinal direction of the resonance member and c) comprises computing a height (h_s) of the settled bed based on the measured resonance frequency (f_o) and the determined indication of the tensile force or the imposed tensile force.

The elongated resonance member extends in a vertical direction, i.e. from a lower end, which may be at the bottom of the loading space, to a position above the loading space.

By determining or imposing the tensile force in the resonance member, i.e. the force in the longitudinal direction of the resonance member, the effect of lateral forces acting on the part of the resonance member inside the settled bed, will at least partially be compensated, resulting in a more accurate computation of the height of the settled bed. Also deformation of the vessel and therewith stretching of the resonance member will be at least partially compensated in this way. When the tensile force is imposed, the tensile force is known despite lateral forces and other disturbances. When the tensile force is measured, it is measured repeatedly to take into account changes of the tensile force F_s during the loading process.

For instance, if the settled bed exerts a lateral force to the resonance member, the resonance member will be pushed in a lateral direction, resulting in an increased tensile force and thus in an increased resonance frequency. The measurements and

CLAIMS

1. Method for determining a height (h_s) of a settled bed in a mixture in a loading space of a vessel, wherein the mixture consists of a settled bed and a mixture soup which is located above the settled bed, and wherein the method comprises:

a) providing an elongated resonance member in the loading space which extends in a substantial vertical direction,

b) measuring a resonance frequency (f_o) of the resonance member,

c) computing a height (h_s) of the settled bed based on the measured resonance frequency (f_o),

wherein b) comprises determining an indication of or imposing the tensile force (F_s) acting in the longitudinal direction of the resonance member and c) comprises computing a height (h_s) of the settled bed based on the measured resonance frequency (f_o) and the determined indication of the tensile force (F_s) or the imposed tensile force (F_s).

2. Method according to claim 1, wherein c) comprises solving $h_s = L_{total} - 0.5 (F_s / \sigma)^{0.5} / f_o$, wherein h_s is the height of the settled bed, L_{total} is the total length of the resonance member, F_s the tensile force , σ the mass of resonance member per meter and f_o the resonance frequency.

3. Method according to claim 1, wherein c) comprises computing the height (h_s) by computing a simulation of the elongated resonance member or by comparing the measured resonance frequency (f_o) and the determined indication of the tensile force (F_s) or the imposed tensile force (F_s) with predetermined calibration data.

4. Method according to any one of the preceding claims, wherein the tensile force (F_s) is imposed by mounting the resonance member at its upper end by means of a flexible connection.

5. Method according to claim 4, wherein action c) comprises modeling the flexible connection and compensating for the influence of the flexible connection on the resonance frequency.